

CLAIMS

1. A component mounting apparatus comprising:
 - a component feed unit (6) for executing component feed operation for feeding a plurality of components (1) in order to allow the components to be picked up;
 - a head unit (4, 404a, 404b) which has a plurality of component holding members (3, 403) for releasably holding the components, for executing component holding and pickup operation for holding and picking up the components from the component feed unit to mount the components onto a board (2) by one or the plurality of component holding members;
 - a head unit control section (40, 440, 460) for controlling the component holding and pickup operation of the head unit;
 - a component feed unit control section (50, 480) for controlling the component feed operation of the component feed unit; and
 - a main control section (30, 330, 430) for transmitting recipes of an operation programs for executing the operations in the head unit control section and the component feed unit control section to the head unit control section and the component feed unit control section,
- 25 wherein the head unit control section is operable

to execute the component holding and pickup operation on basis of the transmitted recipe, and the component feed unit control section is operable to execute the component feed operation based on the transmitted recipe.

5 2. The component mounting apparatus as defined in claim 1, wherein

the head unit control section is provided for the head unit, and the component feed unit control section is provided for the component feed unit.

10 3. The component mounting apparatus as defined in claim 1, wherein

the head unit control section is operable to execute the component holding and pickup operation on basis of the transmitted recipe and is operable to transmit a 15 timing signal based on the execution to the component feed unit control section, and

the component feed unit control section completes the component feed operation on basis of the transmitted recipe and timing signal.

20 4. The component mounting apparatus as defined in claim 3, wherein

the component feed unit control section is operable to transmit a timing signal based on the executed component feed operation to the head unit control section, 25 and

the head unit control section is operable to complete the component holding and pickup operation on basis of the transmitted timing signal and recipe.

5. The component mounting apparatus as defined in 5 claim 1, further comprising:

a head moving unit (8, 408a, 408b) for executing head moving operation for moving the head unit in a direction roughly parallel to a surface of the board; and

10 a moving unit control section (60, 450, 470) for controlling the head moving operation of the head moving unit,

15 wherein the main control section is operable to transmit the recipe for executing the head moving operation in the moving unit control section to the moving unit control section, and

the moving unit control section is operable to execute the head moving operation on basis of the transmitted recipe.

6. The component mounting apparatus as defined in 20 claim 5, wherein the moving unit control section is provided for the head moving unit.

7. The component mounting apparatus as defined in claim 5, wherein

25 the head unit control section is operable to transmit a timing signal based on the execution of the

operation to the moving unit control section, and
the moving unit control section is operable to
complete the head moving operation on basis of the
transmitted recipe and timing signal.

5 8. The component mounting apparatus as defined in
claim 7, wherein

the moving unit control section is operable to
transmit a timing signal based on the executed head moving
operation to the head unit control section, and

10 the head unit control section is operable to
complete the component holding and pickup operation on
basis of the transmitted timing signal and recipe.

9. The component mounting apparatus as defined in
claim 5, wherein

15 the head unit is operable to execute component
mounting operation for mounting the component or components
held by the one or the plurality of component holding
members by releasing the holding on the board,

20 the main control section is operable to transmit
the recipe for executing the component mounting operation
to the head unit control section and is operable to
transmit the recipe for executing the head moving operation
for the component mounting operation to the moving unit
control section,

25 the head unit control section is operable to

execute the component mounting operation on basis of the transmitted recipe, and the moving unit control section is operable to execute the head moving operation for the component mounting operation on basis of the transmitted
5 recipe.

10. The component mounting apparatus as defined in claim 9, wherein

the head unit control section is operable to execute the component mounting operation on basis of the transmitted recipe and is operable to transmit a timing signal based on the execution of the operation to the moving unit control section, and
10

the moving unit control section is operable to complete the head moving operation for the component mounting operation on basis of the transmitted recipe and timing signal.
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11. The component mounting apparatus as defined in claim 3, wherein

the recipe for executing for the component holding and pickup operation comprises:
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an operation program for executing component holding preparation operation for moving down the one or the plurality of component holding members for holding the component or components in the head unit to a component holding standby height position (H1) along a direction
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roughly perpendicular to a surface of the board; and
an operation program for executing component holding main operation for further moving down the one or the plurality of component holding members from the component holding standby height position and holding the component or components allowing to be picked up in the component feed unit by the one or the plurality of component holding members, and

the head unit control section is operable to make the component feed unit control section recognize completion of the component holding preparation operation on basis of the recipe by transmitting the timing signal.

12. The component mounting apparatus as defined in claim 11, wherein

15 the component feed unit comprises a plurality of component pickup positions (7a) in which the components are arranged allowing to be picked up by the component holding member,

the recipe for executing the component feed operation comprises:

an operation program for executing component feed preparation operation for transporting the components in the component feed unit so that the components are positioned in the component pickup positions; and

25 an operation program for executing component feed

main operation for putting the transported components into a state in which the components can be picked up by the component holding member, and

the component feed unit control section is
5 operable to execute the component feed preparation operation on basis of the recipe, to complete the component feed main operation on basis of the recipe and the timing signal from the head unit control section and to make the head unit control section recognize completion of the
10 component feed main operation by transmitting the timing signal to the head unit control section.

13. The component mounting apparatus as defined in claim 3 or 7, wherein the head unit control section is operable to transmit a plurality of timing signals formed
15 on basis of elevation positions of each of the component holding members along a direction roughly perpendicular to the surface of the board.

14. The component mounting apparatus as defined in claim 5, wherein

20 the main control section comprises:

a recipe forming section (33, 333) for forming each of the recipes; and

a recipe transmission section (32, 332) for transmitting each of the formed recipes.

25 15. The component mounting apparatus as defined in

claim 14, wherein

the head unit control section, the component feed unit control section or the moving unit control section is operable to transmit error information generated when the 5 operations are executed on the basis of the respective recipes to the main control section,

in the main control section,

the recipe forming section is operable to correct the recipe relevant to the error information out of the 10 already transmitted recipes on basis of the transmitted error information, and

the recipe transmission section is operable to transmit the corrected recipe while in order to allow the already transmitted recipe to be replaced by the corrected 15 recipe.

16. The component mounting apparatus as defined in claim 3, wherein

the component feed unit comprises a plurality of component pickup positions (7a) that are arranged in a line 20 with a constant pitch (P2) and arranges the components allowing to be picked up by the component holding members,

the component holding members are arranged with a constant pitch (P1) of an integral multiple of the constant pitch in the head unit along the direction in which the 25 component pickup positions are arranged, and

the recipe for the component feed operation transmitted from the main control section to the component feed unit control section comprises at least positional information of the one or the plurality of component pickup 5 positions where the component feed operation is executed.

17. The component mounting apparatus as defined in claim 16, wherein

the recipe for the component holding and pickup operation transmitted from the main control section to the 10 head unit control section comprises at least information capable of recognizing the one or the plurality of component holding members in which the component holding and pickup operation is executed and positional information of the one or the plurality of component pickup positions 15 where the component feed operation is executed.

18. The component mounting apparatus as defined in claim 5, wherein

the recipe for the head moving operation transmitted from the main control section to the moving 20 unit control section comprises at least positional information of a movement position of the one or the plurality of component holding members in a direction roughly along the surface of the board where the component holding and pickup operation is executed or the component 25 mounting operation is executed.

19. The component mounting apparatus as defined in claim 18, wherein

the recipe for the component mounting operation transmitted from the main control section to the head unit control section comprises at least information capable of recognizing the one or the plurality of component holding members by which the component holding and pickup operation is executed or the component mounting operation is executed.

20. A component mounting apparatus comprising:

a component feed unit (6) for executing component feed operation for feeding a plurality of components (1) in order to allow the components to be picked up;

a head unit (4, 404a, 404b) which has a plurality of component holding members (3, 403) for releasably holding the components, for executing component holding and pickup operation for holding and picking up the components from the component feed unit to mount the components onto a board (2) by one or the plurality of component holding members;

a head unit control section (40, 440, 460) for controlling the component holding and pickup operation of the head unit; and

a main control section (30, 330, 430) for transmitting recipes of operation programs for executing the component holding and pickup operation in the head unit

control section to the head unit control section and for controlling the component feed operation in the component feed unit,

5 wherein the main control section is operable to complete the component feed operation and is operable to transmit the recipe to the head unit control section, and

the head unit control section is operable to complete the component holding and pickup operation on basis of the transmitted recipe.

10 21. The component mounting apparatus as defined in claim 20, wherein the head unit control section is provided for the head unit.

22. A component mounting method for executing component feed operation for feeding a plurality of 15 components (1) in a component feed unit (6) in order to allow the components to be picked up and executing component holding and pickup operation for picking up the components from the component feed unit to mount the components onto a board (2) in a head unit (4, 404a, 404b) 20 that has a plurality of component holding members (3, 403) that releasably hold the components by the one or the plurality of component holding members, the method comprising:

25 receiving a recipe for the component holding and pickup operation of an operation program for executing the

component holding and pickup operation in the head unit, executing the component holding and pickup operation on basis of the received recipe and transmitting a timing signal based on the execution of the operation to the 5 component feed unit; and

receiving a recipe for the component feed operation of an operation program for executing the component feed operation in the component feed unit and completing the component feed operation on basis of the 10 received recipe and the timing signal transmitted from the head unit.

23. The component mounting method as defined in claim 22, wherein

each of the recipe for the component holding and 15 pickup operation and the recipe for the component feed operation is formed on a component mounting apparatus main body side provided with the head unit and the component feed unit, and

each of the formed recipes is transmitted from 20 the component mounting apparatus main body side to the head unit and the component feed unit.

24. The component mounting method as defined in claim 22, wherein

the timing signal on basis of the execution of 25 the component feed operation based on the recipe is

transmitted to the head unit during the execution in the component feed unit, and

the component holding and pickup operation is executed in the head unit also on basis of the timing signal transmitted from the component feed unit.

25. The component mounting method as defined in claim 22, further comprising:

executing head moving operation for moving the head unit to a place above the board in a head moving unit (8, 408a, 408b) that moves the head unit in a direction roughly parallel to a surface of the board; and

executing component mounting operation for mounting the component or components held by the one or the plurality of component holding members onto the board,

15 whereby a recipe for the component mounting operation for executing the component mounting operation is received in the head unit, the component mounting operation is executed on the basis of the received recipe and a timing signal based on the execution is transmitted to the head moving unit; and

20 a recipe for the head moving operation for executing the head moving operation is received in the head moving unit, and the head moving operation is completed on basis of the received recipe and the timing signal transmitted from the head unit.

26. The component mounting method as defined in claim 25, wherein

each of the recipe for the component mounting operation and the recipe for the head moving operation is formed on the component mounting apparatus main body side, and

each of the formed recipes is transmitted from the component mounting apparatus main body side to the head unit and the head moving unit.

10 27. The component mounting method as defined in claim 25, wherein

the timing signal on basis of the execution of the head moving operation based on the recipe is transmitted to the head unit during the execution in the head moving unit, and

the component mounting operation is executed in the head unit also on the basis of the timing signal transmitted from the head moving unit.